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A BOUQUET FROM DOCTOR HOWARD

"I have just been studying the October number of the Monthly Letter and I am delighted. It is a wonderful revelation of the interesting and important work that is going on in the Bureau. Marchal is dining with me this week and I have marked a number of paragraphs to show him. I am sure that he will wonder at the number of advances that have been made since he was with us in 1913." Paris, January 5, 1932.

OFFICE CHANGES TO AGREE WITH REORGANIZATION

Last spring the Secretary approved and authorized certain changes in the Bureau organization to effect a more favorable and logical grouping of subject matter. This regrouping brings together related activities, or activities which involve related control methods. While this regrouping was approved last spring, it was impractical to put it into full operation during the summer period of intensive field and office work, and the definite office shifts were not made until November. In agreement with the plan of reorganization, Dr. T. E. Snyder was moved to Building "F"; the Division of Fruit and Shade Trees to the quarters heretofore used by the Office of Tropical and Subtropical Plant Insects, with additional rooms across the hall; and the enlarged Division of Truck and Garden Crop Insects was quartered in the rooms previously occupied by Doctor Howard, E. B. O'Leary, and W. F. Tastet. In addition to these changes there were also minor adjustments in the Administrative Offices. The changes in the distribution of subject matter in the Bureau resulting from the reorganization are described in the Annual Report of the Chief of the Bureau for the fiscal year 1931. This report also briefly discusses certain changes in personnel. Those who have not yet seen this report can secure copies by request through the usual channels.

INTRODUCED NATURAL ENEMIES CONTROL BLACK FLY

Work on the important cooperative project with the Cuban Department of Agriculture, looking to the control of the citrus black fly by importing its natural enemies from Asia, which has covered two and one-half years, was brought to a very successful conclusion the latter part of the month of November. This work has been discussed in the last two annual reports of the Chief of Bureau and in the Official Record of the Department (November 6, 1930). C. P. Clausen made the studies, collections, and shipments of parasitic and predacious enemies in Malaya, returning to this country in June, 1931, with the last consignment of material. The work of breeding and colonization in Cuba was conducted by P. A. Berry, assisted by J. M. McGough, and was given personal attention by Mr. Clausen for considerable periods in the interval between the two expeditions to Malaya and in connection with the final consignment. Mr. Clausen found altogether 15 species of parasites and predators attacking the black fly in Malaya and the Dutch East Indies. Of these 6 were actually brought into Cuba, 4 parasitic flies and 2 predacious coccinellids. Only one of the parasitic flies was successfully established, Eretmocerus serius Silv., discussed at some length on page 8 of the Monthly Letter for November, 1931. Of the two coccinellids, which seem to be successfully established in Cuba, the smaller one, Scymnus smithianus Silv., was recovered through several generations and did well during the dry season but declined during the rainy season. The large coccinellid, Cryptognatha sp., bred freely in the Island and actually effected commercial control in a few groves, but seems to be important only in groves where the black fly infestation is very severe, where, in the instances referred to, it eliminated the black fly infestation in less time than the parasite. The notable immediate and future benefit, however, would seem clearly to rest with the parasite, Eretmocerus serius, which alone bids fair to solve the control of the black fly in Cuba, and the same result is anticipated in other sections. In addition to the clean-up of the black fly indicated for Cuba, it has been possible to establish colonies in Haiti, the Canal Zone, and the Bahamas. The Cuban officials are prepared to carry on the necessary work with these parasites and have indicated willingness to cooperate in their introduction into other regions of the West Indies and Central America.

TOXICOLOGY AND PHYSIOLOGY OF INSECTS

D. E. Fink, who is making studies of the distribution of radioactive lead arsenate in insect tissue and organs, using the photographic method, at Takoma Park, Md., reports: "The evidence, so far gathered, from these studies points to the fact that the major distribution of radioactive lead arsenate after it leaves the digestive tract is accomplished through the medium of the blood stream. Centers of intense radiation, * * * are due to (1) the presence of undigested plant tissue

remaining in the digestive tract, and (2) accumulations of blood inclusions trapped by tissues. Naturally, the most intense radiation from radioactive lead arsenate lines the walls of the entire digestive tract from the esophagus to the rectum. Accumulation of feces in the rectum indicates a center of radiation at that point. On the other hand, photographic prints of insect material that had the entire digestive tract removed previous to fixation and sectioning show an almost even distribution as revealed by the intensity of the radiation through the musculature system upon a negative plate. Undoubtedly a differentiation must exist with the uptake of different quantities of radioactive lead arsenate conditioned by various musculature activities. Such slight differentiation, however, could only be detected with the aid of a densitometer."

F. L. Campbell, in charge of the laboratory at Takoma Park, Md., concerned in fundamental studies of physiology and toxicology of insects, submits a number of interesting photographs and a reading statement indicating the work of equipping, systematizing, and improving methods of rearing house flies for experimental purposes in a constant temperature, in the development of which method he has "striven for simplicity, cleanliness, and standardization."

BEE CULTURE

E. L. Sechrist, of the Davis, Calif., laboratory, writes: "A trip was made to the cedar forests of Eldorado County, Calif., to investigate the reported change in the character of honeydew on the incense cedar. Earlier in the season it had been found that the cottony cypress scale was secreting, on these trees, a dark, strong-flavored honeydew of which bees stored a considerable quantity. The same trees and the same insects at this time were producing globules of clear white and mild, pleasant flavored honeydew, some of these globules being larger than peas, and so abundant that the nectar was running down the trunks of trees and covering the stones and earth under the trees. The weather at this time had become cold and all apiaries had been moved out of the territory visited. On the day of our visit the temperature was such, however, that bees could have flown freely. No bees were observed on this honeydew. Mr. Watkins reports that this flow of white honeydew usually comes much earlier. He has samples of this "cedar honey" that are water white and of excellent flavor. The chemistry department of the University of California is interested in this change in character of secretion and is studying the material, including branches and insects with attendant honeydew, which we brought back."

W. J. Nolan, Somerset, Md., in reporting on carrying weak bee colonies over during the winter period in "compartment hives," observed that virgin queens emerged as late as the last week in November.

This is a rather unusual record for this part of the country. It indicates to what extent weather conditions have varied from normal.

George E. Marvin, Somerset, Md., who has been working with R. R. Pailthorp and R. L. Spangler, of the Bureau of Agricultural Economics, on a revision of the United States grading rules for honey, reports that considerable difficulty has been experienced in writing accurate definitions for comb honey which would make possible the inclusion in the grades of all edible and shipable comb honey produced in the United States. Because of the increased production of wrapped cut comb honey, new grading rules are being prepared which will make provision for this method of packing comb honey. Mr. Marvin also reports that further work is being done more accurately to define the minimum specific gravity for honey which will be allowed under the grading rules.

C. E. Burnside, Somerset, Md., reports isolating in a sample of diseased brood from Ohio an organism indistinguishable from the organism isolated from diseased material obtained from Georgia and Florida, which has taken on the appearance of a brood disease new to apiculture. The organism in question appears closely related to Bacillus alvei Cheyne, one of the forms found associated with European foulbrood. There are, however, morphological and cultural differences which make it readily distinguishable from B. alvei.

A. P. Sturtevant, of the Intermountain States Bee Culture Field Laboratory, Laramie, Wyo., who attended the annual meeting of Southern Montana Beekeepers' Association at Billings, Mont., reports that unusual interest was manifested in the methods of treating with chlorine combs infected with American foulbrood. A new method was recently announced by the University of Minnesota in which chlorine is used in aqueous solution. The beekeepers are particularly anxious to learn about the practicability of this method. Doctor Sturtevant also mentioned that O. A. Sippel, State Apiarist, Bozeman, Mont., gave an interesting account of a survey of bee trees in which a large proportion were found to contain American foulbrood.

Warren Whitcomb, jr., of the Southern States Bee Culture Field Laboratory, Baton Rouge, La., reports that at the close of the active season the last observations on the supersedure of queens after shipment indicate that the relatively new method of shipping queens in "dry cages" in packages appears to have slight advantages over other methods so far as successful introduction is concerned. It is too early to note any difference in the various methods of shipping queens with respect to effect on supersedure. Doctor Whitcomb also reports that the laboratory has been rearing a large number of larvae of Galleria mellonella L. for the purpose of inaugurating experiments dealing with the practical control of this pest, which causes sericus losses in the Southern States.

FRUIT AND SHADE TREE INSECTS

H. G. Butler, in charge of the peach insect investigations at Harriman, Tenn., submits a summary of the life-history data for the plum curculio (Conotrachelus nenuphar Herbst) from which the following data are gleaned: In an orchard that was not sprayed in 1930, jarring was started March 13 and the first adults were taken April 10. For the whole period covering April 10 to May 22, the accumulated catch on 77 trees averaged 8.21 curculios per tree. Egg-laying began April 20 and continued until August 18--121 days, covering practically the whole of the period of peach development. The curculios began leaving the fruit May 22 and the first adults of this brood emerged from the soil June 23. From a study of individual oviposition records of first-brood adults it was found that only 5 out of 64, selected at random without sex determination, deposited eggs. These 5 averaged 11.4 eggs each. The preoviposition period of these beetles averaged 15.29 days with a maximum of 17 days and a minimum of 12 days.

Reporting on parasities of the obscure scale (Chrysomphalus obscurus Comst.) on pecan, Howard Baker, Shreveport, La., states: "The emergence of parasites from field-collected material continued at an unseasonably high rate during November, nearly as many specimens being taken as in October. The species Ablerus clisiocampae Ashm. did not continue emergence during November, however. Additional evidence was gathered showing this last-mentioned species to be a hyperparasite of Prospaltella fuscipennis. The number of specimens emerging during November was as follows: Prospaltella fuscipennis Gir., 59; Prospaltella berlesii How., 8."

In connection with control experiments against the hickory shuckworm (Laspeyresia caryana Fitch) at Albany, Ga., G. F. Moznette submits a summary of the results of a "test to determine the value of spraying with hydrated lime (50 pounds to 100 gallons of water) as a control measure for the shuckworm,"in which" a row of alternate Moore and Pabst were selected. The experiment was planned so that two trees (one of each variety) were sprayed and two adjacent trees were left unsprayed as a check. Records were obtained by collecting samples of 100 nuts each from five trees of each variety of both sprayed and unsprayed." The percentage of infestztion for the Moore variety was 5.2 and for the Pabst variety 8.6 . The check plot showed an infestation of 26.2 per cent for the former variety and 34.8 per cent for the latter. "Some defoliation was observed on sprayed trees. * * * no rain sufficient to wash off any of the spray occurred from the time of the first application until the nuts were harvested."

E. J. Newcomer, Yakima, Wash., reports some results of spraying experiments against the codling moth (Carpocapsa pomonella L.): "The use of mineral oil emulsion, added to the lead arsenate, has given the best control. Two applications of oil (one at the height of each brood) resulted in an average of about 18 per cent of wormy apples as compared with over 22 per cent where no oil was used. More applications of oil

further reduced the infestation, there being only about 5 to 7 per cent of wormy apples where four to six oil sprays were used. The percentage of stung fruit is also interesting, being 22 per cent for no oil, 19 per cent for two oil sprays, and 4 to 10 per cent for four to six oil sprays. According to western grade rules, one or more healed stings on an apple put it in a lower grade with a value of about 25 cents a box less, and stings that are not healed cause an apple to be classed as a cull. Therefore, the difference in stings is important, as our classification of stings includes all that are less than 1/4 inch in depth, whether healed or not. These figures are the result of spraying the same trees in the same manner for two years."

Mr. Newcomer also reports on a "block of 64 (apple) trees * * * that has been banded for two years with corrugated paper bands treated with beta-naphthol. The difference in infestation this year was remarkable. A ratio has been figured of the number of worms in 1931 to the number in 1930, both in the banded block and in three unbanded blocks which had identical spray treatments. * * * It is found that in the banded block, for every worm last year, there were 1.22 worms this year, and in the blocks not banded, for every worm last year there were 2.55 worms this year. It should be remembered that this has been the worst codling moth year we have ever experienced. It was also found that 3 and 4 inch bands did not catch any more worms than 2 inch bands; that by picking time only about 19 per cent of the worms had left the Jonathan and 37 per cent had left the Winesap; and that of those that had left the apples about one-third were in the bands."

E. H. Siegler, of the Takoma Park, Md., laboratory, who devised chemically treated codling moth bands, and is cooperating with the work-out of these bands through leaders of various laboratories of the Bureau concerned in investigation of the codling moth, submits a summary of data on the comparative value of bands of different widths as tested at six field laboratories. Mr. Siegler says: "these studies were made by using half and half bands in order to eliminate insect population heterogeneity in so far as possible. * * * in Experiment 1 ten trees were used. Each of these trees was provided with two so-called half bands, one of which was 4 inches in width and the other 3 inches. Each of these bands extended half way around the tree trunk. The results show in this experiment that 538 insects were captured by the 4-inch width and 432 by the 3-inch width band." A total of 81 trees were banded and a total of 8,054 larvae were found in the 4-inch bands, whereas 7,361 larvae were found in the 3-inch bands. However, at three laboratories the 3-inch bands yielded fewer larvae (425) than the 2-inch bands (449). The Bureau specialists "suggest to growers the use of a 2-inch width in preference to one 4 inches wide, in spite of the fact that the wider bands have captured a somewhat larger number of insects. The additional number captured, however, by the wider band appears too small to justify its double cost, except in districts in which the insect population is so great that a two-inch width band has insufficient capacity."

Concerning studies of chestnut weevils by himself and assistants at the Takoma Park laboratory, Mr. Siegler states: "It is of interest to note the great preponderance of the smaller chestnut weevil (Curculio auriger Casey) over that of the larger (C. proboscideus Fab.). Up to the present writing we have reared 61,323, out of which 99.4 per cent comprised the smaller species. Since the seasonal cycles of these weevils are somewhat unlike and require that control measures be taken at different times, it is obvious from the above disclosure of relative abundance that special emphasis should be given toward the control of the smaller species."

H. W. Allen, in charge of investigations of parasites of the Oriental fruit moth (Laspeyresia molesta Busck) at Moorestown, N. J., says: "As a result of the recovery studies of this past season, a much clearer idea of the status of various oriental fruit moth parasites has been obtained. There seems to be a fairly clear line of demarcation between those which attack the egg, the twig-infesting larvae, or the cocoons, although except for Trichogramma, and possibly Apanteles, all emerge from the cocoon stage. The following species are preeminently cocoon parasites: (1) Aenoplex betulaecola Ashm., (2) Calliephialtes grapholithae Cress., (3) Centeterus ineptifrons Gahan, (4) Dibrachys boucheanus Ratz., (5) Ephialtes aequalis Prov., (6) Epiurus indagator Cress., (7) Eupelmus amicus Gir., (8) Eurytoma sp., (9) Hemiteles tenellus (Say), (10) Itoplectis conquisitor (Say), (11) Microbracon mellitor (Say), and (12) Perilampus sp. Those emerging from the prepupa are numbers 1, 2, 4, and 5; from the pupa, 3, 5, 10, and 12; from either, 7, 8, 9. Numbers 1, 2, 3, 5, 6, 10, 11, 12, and 13 have been recovered only as primary parasites of the oriental fruit moth, while 4, 7, 8, and 9, have been recovered both as primaries and secondaries. A final check of native parasites reared this year is: Twig-larval parasites, 15 known, 2 unknown, total 17; cocoon parasites, 12 known, 3 unknown, total 15; total parasite species 32."

Mr. Allen notes that Macrocentrus ancylivora Roh. "was this year recovered from all but 3 of the 18 States in which recovery collections were made, and that these recoveries were from 36 counties widely scattered over this area. Only one species, Glypta rufiscutellaris Cress., was recovered from a larger number of counties (43). Since four years ago M. ancylivora was not known as a parasite of the peach moth outside a limited eastern distribution, this evidence of widespread distribution following three seasons' colonization is quite pleasing."

"The two most effective baits (for the oriental fruit moth) during the past season," according to L. F. Steiner, Cornelia, Ga., "were 10 per cent solutions of No. 3 remelt sugar with 1/4 cubic centimeter emulsified ethyl cinnamate per quart added, and medium soft sugar with terpinyl acetate added at the rate of 1 or even 1/4 cubic centimeter per trap. The latter appeared 75 per cent more attractive than the check which was a 10 per cent medium soft sugar solution plus 1/4 cubic centimeter emulsified ethyl cinnamate per trap. This check bait was the most attractive

among the 1930 tests and 100 traps of it distributed uniformly over the 37-acre area this season captured 47 per cent more moths per trap than the average of the other 115 baits tested there. The fact that this bait was used throughout the 42,000-trap area where the moth catch per acre was half as much but the worm entrances in fruit twice as numerous seems to prove that a mixture of different baits makes for greater efficiency."

Mr. Steiner states that estimates of the costs of bait trapping "including interest and depreciation indicate that baiting could be practiced by individual growers in this vicinity for 7 1/4 cents per tree or $8.00 per acre for a six-month period if one trap is operated in every second tree and the work is conducted on a 400-acre basis."

James Zetek, Panama Canal Zone, submits additional data on pupation of Anastrepha striata Schin. Using 50 larvae in each case, one set kept in light pupated the same day; the other, kept in total darkness, distributed pupation over three days, beginning on the first day. The first test was in petri dishes and was without earth or water. These tests were repeated with a small amount of water added, all of the larvae mature and from the same source. "Those in the light behaved as follows: At 11.30 a.m. November 16, test started; at 5.00 p.m. no larvae had pupated; on November 17, 29 puparia: on November 18, 3 puparia; on November 19, 4 puparia; on November 20, 1 puparium; on November 23, 1 puparium and 12 dead larvae. One of the larvae pupated on under side of upper dish. Those in the dark behaved as follows: At 11.30 a.m. on November 16, test started: at 5.00 p.m. no larvae had pupated; on November 17, 5 puparia; on November 18, 4 puparia; on November 19, 5 puparia; on November 20, 5 puparia and 31 dead larvae. Additional tests were made with mature larvae of striata by submerging them in water for various periods." Results showed that submergence for 5 to 48 hours results in dead pupae and that submergence for 25 to 68 hours is fatal to larvae.

A. C. Mason, of the Mediterranean fruit fly project at Honolulu, T. H., reports on the hibernation of Diachasma tryoni Cam.: "A collection of parasitized fruit fly larvae which pupated on August 22 was taken up to an elevation of 1,800 feet and held. They produced 139 D. tryoni adults between September 10 and 28, 1 on November 2, and one on November 4. The last two had hibernated more than six weeks after the majority of the parasites emerged. A similar collection of pupae (formed also on August 22) produced 172 D. tryoni between September 6 and 24, at the 1,000-feet elevation. After being carried down to the laboratory on October 19, the remaining unemerged pupae produced 4 adult D. tryoni between October 22 and November 9."

A study of the longevity of adult fruit flies is also reported by Mr. Mason: "In order to determine the relation of temperature to longevity of the adults, cages containing 60 freshly emerged adults were placed at each of the three elevations under observation. They were

fed on sugar syrup and distilled water. At the Experiment Station (200 feet) 47 of the adults died between August 31 and November 23. At the 1,000-feet area 37 adults died between September 24 and November 16; at the 1,800-feet elevation only 13 adults have died between September 6 and November 23. These observations demonstrate that the adults live longer at higher elevations when the temperature is lower."

The experiments by H. H. Richardson, of the greenhouse at Washington, D. C., on the control of the common red spider mite (Tetranychus telarius L.) with pyrethrins, nicotine, and rotenone, as thus far conducted, are summarized briefly as follows: "Without the addition of some 'wetting' agent, the pyrethrins, rotenone, and nicotine were relatively inefficient, even at high concentrations, for the control of the greenhouse red spider mite. With the addition of potassium oleate soap (0.25 per cent, 1-400) rotenone was slightly more toxic than the pyrethrins; nicotine was much less potent than either of the other two. Soap appeared to be a more efficient wetting agent than sulphonated castor oil for the pyrethrins and rotenone; with nicotine the reverse appeared to be true. Hydrogen-ion studies indicated that when these materials were added to diluted spray solutions, the pyrethrins (in alcoholic extracts) had a distinctly acidic effect, rotenone (in acetone solution) had relatively slight effect; nicotine (chemically pure) had a distinctly alkaline effect."

The following summary has been prepared from a report made by Oliver I. Snapp, dealing with extensive experiments conducted at Fort Valley, Ga., in the control of the peach borer (Synanthedon exitiosa Say) with paradichlorobenzene dissolved in cottonseed oil and in mineral oil, respectively, and then emulsified and applied as a spray to the base of the tree. The emulsion was used in such quantities that the amount used on each tree was equivalent to that ordinarily applied in the form of crystals. The paradichlorobenzene applied in an emulsion at strengths up to one-half ounce of the chemical per tree on 1-year and 2-year trees, and up to three-fourths of an ounce per tree on 3-year-old trees, caused no injury. On 6-year-old trees, with a dosage of one ounce per tree, no injury occurred except one or two small spots where the spray had puddled. The usual crystal treatments, on the other hand, caused severe injury to 1-year, 2-year, and 3-year-old trees. When mineral oil was used as a carrier, a little injury occurred with a dosage of three-fourths ounce of paradichlorobenzene on 3-year-old trees. Where the tree trunks were mounded after being sprayed the emulsions gave a kill of borers equivalent to that obtained with the standard crystal treatment with equal quantities of chemical. When the trees were not subsequently mounded the borer control was comparatively poor. The emulsion treatment appears to offer a safe method of treating young trees, whereas such trees are frequently injured by the standard crystal treatment under Georgia conditions.

Mr. Snapp reports continued satisfactory results in the control of the lesser peach borer (Synanthedon pictipes G. & R.) from the use of

paradichlorobenzene dissolved in cottonseed oil and painted on the injured areas. Mineral oil was also tried as a solvent, and while the control of borers appeared even better than that obtained with cottonseed oil, the solution caused considerable injury to the bark and wood adjacent to the infested areas.

Mr. Snapp has also conducted numerous tests of naphthalene as a possible substitute for paradichlorobenzene in the control of the two peach borers, the tests being parallel to those outlined in the preceding paragraphs. The results have been clear cut and definite; naphthalene used as outlined was found ineffective in the control of the borers and quite injurious to trees.

JAPANESE BEETLE AND ASIATIC BEETLE RESEARCH

Henry Fox, Moorestown, N. J., reporting on life history and habits of the Japanese beetle (Popillia japonica Newm.), states that the downward movement of larvae in the soil was completed in November and winter dormancy began. He says: "Despite the remarkably high temperatures prevailing during much of the second half of November, no indications of an upward movement of the larvae, which under the circumstances might have been expected, were observed. At present they are concentrated at a depth of from 2 to 6 inches below the surface."

On the life history and habits of the Asiatic beetle (Anomala orientalis Waterh.) and the Asiatic garden beetle (Autoserica castanea Arrow), H. C. Hallock, of the Westbury, N. Y., sublaboratory, says that "after the middle of November most of the larvae of Autoserica castanea and Anomala orientalis were 8 to 12 inches beneath the surface, although some larvae could still be found within 4 to 6 inches of the surface during the last week of November. The very mild weather during this month is doubtless responsible for some of the larvae remaining nearer the surface than usual at this season of the year."

F. E. Baker, Moorestown, reports that "nine more organic chemicals were tested against third-instar larvae of the Japanese beetle, using 25 per cent saponified castor oil soap as the emulsifier. "It was found at this time that the soap was not emulsifying properly, which was apparently due to a deficiency of alkali. Consequently a completely saponified castor oil soap was made, * * * a test was run to determine the toxicity of the soap alone. It was found that 25 cc., 35 cc., 50 cc., and 75 cc. gave practically the same kill, which averaged 15.4 per cent. An increase in the amount of soap to this point seemed to have no effect on the larvae, although the completely saponified soap seemed to be slightly more toxic than the 25 per cent saponified soap previously used. The above tests involved the use of 7,400 third-instar larvae."

Tests of the influence of soil moisture in fumigation with hydrocyanic acid are reported by J. W. Lipp, Moorestown, who says: "Examinations were made on November 2 of two soil balls treated on October 26 with 1/2 pound of 'Zyklon Discoids' per 1,000 cubic feet for 2 hours (one tree was dry and one damp when treated). The treated trees stood outdoors the night following the treatment, were dampened and brought into a warm room the following afternoon where they remained until examined, when the soil ball, which was dry at the time of treatment, showed 3 living and 22 dead larvae and the damp soil 18 living and 5 dead. A check tree showed 23 living larvae. Under the conditions mentioned it is evident that soil moisture is a decidedly limiting factor in HCN-fumigation."

L. B. Parker, reporting on emergence of Tiphia malayana Cam. at Yokohama, Japan, says: "On October 30 nine adult Tiphia were noticed to have emerged from cocoons that had resulted from experimental rearing with adult females of Tiphia malayana (Japanese var.). Forty-three cocoons of the same lot, from which 200 cocoons were shipped to Moorestown on August 15, were placed in a glass jar with moist sphagnum moss and kept under laboratory conditions. It was from these 43 cocoons that the 9 adults emerged (5 females, 4 males). The exact date of emergence is not known but must have taken place between October 20 and 30. The remaining 24 cocoons were dead, having been killed by fungus. * * * The emergence of this species, not only in the laboratory but also in the field, would indicate that this species has two generations per year, at least in this locality.

TRUCK AND GARDEN CROP INSECTS

C. H. Popenoe, of the bramble insects investigations, Arlington, Va., reporting on studies of Aphis rubicola Oestlund, says: "Reproduction, both asexual and sexual, maintained itself throughout the month of November. There was a heavy frost on November 7, the temperature reaching 26° F., but the plants in cages were not seriously injured, and there were no signs of damage to the aphids, which continued to produce both viviparously and oviparously. Both types of reproduction continued throughout the month, although the peak of oviposition was reached during the first week. * * * There was a heavy frost the night of November 27, the temperature dropping to 20° in the cages, but without injuring the aphids."

Life-history studies of the pea aphid (Illinoia pisi Kalt.) at Madison, Wis., according to John E. Dudley, jr., "were rapidly closed out at the end of November. From 25 stem mothers (which hatched from the winter eggs in the spring of the year) two direct lines completed the sixteenth generation and eggs were laid for the beginning of the seventeenth. For the whole season there were 234 mothers which produced 13,336 young and eggs, an average of 57 per mother. One hundred and fifty-eight

eggs have been placed in hibernation in the hope of continuing the studies next summer through aphids of known behavior."

A. C. Davis, Takoma Park, Md., reports that "during the early part of the month (November), in conjunction with E. B. Lambert, experiments were continued to determine conditions in composting manure at Arlington Farm and at a mushroom plant at Capital Heights, Md. Mr. Lambert also made some observations in Pennsylvania. It was found that (the temperature of) the manure, except for a shell of about 6 inches on the top and sides, and from 2 or 3 inches to a foot or so on the ground, is in excess of 120° F., reaching 170° in some places. The areas of the different temperatures have been located as accurately as possible, and a contour map of the square, flat-topped heap made. It is planned to experiment with and record data on this subject from heaps of different shapes. Oxygen was found to be nearly lacking, and CO_2 to reach a concentration of 28 per cent in the poorly heated central, ground level portion of the pile. Experiments carried out with mites and springtails * * * in the laboratory indicate that these can survive indefinitely in this atmosphere of CO_2 where the normal amount of oxygen is present in the other 72 per cent of air."

A summary of control operations against the pepper weevil (Anthonomus eugenii Cano) at Alhambra, Calif., is submitted by R. E. Campbell: "Cryolite, potassium hexafluoaluminate, barium fluosilicate, and calcium arsenate were all found to be more or less effective against the pepper weevil when applied under controlled cage conditions where a known number of weevils were introduced. Cryolite was the most effective material and the other materials were each in turn slightly less effective in the order named. The flourine compounds in general showed higher mortality than did calcium arsenate. Barium fluosilicate, though effective as a weevil control, not only burned the leaves but caused stunting and yellowing of the pepper plants. * * * Plants dusted with cryolite exhibited some leaf injury and bud pruning but did not appear unusually yellow or retarded. * * * Even though the flourine compounds materially reduced the infestations they failed to increase production proportionately. In the case of barium fluosilicate the reduction both in infestation and yield is very striking. These plots also showed decided stunting, leaf burning, and bud pruning. In the other plots where cryolite, potassium hexafluoaluminate, or 40 per cent barium fluosilicate was used, the same symptoms were present but varied from very slight to rather noticeable injury. The calcium arsenate plots continued to yield peppers long after there were none left on the other plots."

Mr. Campbell submits additional data on the life history and habits of the wireworm Pheletes californicus Mann. He says: "On November 30, 7 drain tiles, 6 inches in diameter and 24 inches deep, in each of which 50 medium-sized wireworms had been put on July 12, 1930, were taken up and examined," and that larvae were found at depths of 8 to 21 inches and adults at depths of 6 to 14 inches.

Interesting results of feeding experiments with this wireworm are reported by Mr. Campbell: "In one year 18 one to two year old P. californicus larvae reared in salve cans consumed 2,476 kernels of wheat, or an average of 137 kernels, which is equivalent to 4.52 grams of wheat per individual each year. (30.3 kernels wheat = 1 gram.) Mr. Campbell submits a table which shows that a population of one larva per square foot, or 46,560 larvae per acre, will consume 196,891 grams, or 434 pounds of wheat, and that the consumption of wheat increases proportionately with the increase in the number of larvae per square foot.

C. E. Woodworth, of the soil insects laboratory at Walla Walla, Wash., has been making a study to determine the value of pollen in the production of eggs from adults of the wireworm Pheletes canus Lec. It was found that feeding pollen increased egg production from an average of 28 eggs per female to 125. Mr. Woodworth says, "another interesting observation is that 196 eggs were laid by one female fed pollen after mating, this being a high egg production for this species."

R. S. Lehman, Walla Walla, has been conducting baiting experiments against the larvae of P. canus, with ground whole wheat balls placed as controls for the poison baits employed. The poison baits were of the same material with the poison added. The poison baits and the controls were placed in the field alternately, one or two feet apart. Mr. Lehman reports that "out of a total of 1,500 baits 24,821 Pheletes canus larvae were obtained, which is an average of 16.5 larvae per bait. * * * In the poison bait experiments it has been very strikingly shown that the arsenates and arsenites are repellent to P. canus larvae."

The survival of this wireworm (P. canus) at low temperatures has been the subject of study by E. W. Jones, Walla Walla. He concludes: "it is evident that 15° F. (-9.4° C.) was below the freezing point of the larvae. However, the adults seem to have lower under-cooling points than the larvae. Since there is such a great variation in such a group of individuals it is to be expected that many survive 15° F. (-9.4° C.)."

W. C. Cook, Davis, Calif., reports on further study of the migratory movements of the beet leafhopper (Eutettix tenellus Baker): "F. R. Lawson has made a careful study of the migratory movements south of Los Banos and he has concluded that in the southern part of the San Joaquin the movements into the canyons occur largely where there is no food outside. He states, 'The spray program seems to be very successful down to and including Big Panoche; in this section there are practically no perennials on the plains that remain succulent. Bugs are forced into the canyons. I would like to point out that the patch of polycarpa outside the mouth of Little Panoche and the larger one outside Big Panoche held as many bugs as were in the canyons per unit area. The implication is that bugs go into the canyons because there is no food outside.'"

FOREST INSECTS

Ralph C. Hall, Columbus, Ohio, reporting on investigations of the locust borer (Cyllene robiniae Forst.), says: "A number of infested black locust trees were examined during the month to ascertain the development of the young larvae. By the latter part of the month the young larvae had eaten through the outer and inner bark and the majority of them had started to work in the wood. The unusually warm fall may have accounted for this unusual activity. One severely injured tree, 7 years of age, diameter breast height 1.4 inches, and 15 feet in height was very carefully examined for the presence of young locust borer larvae. This tree was found to contain 191 young larvae. They were distributed in the tree as follows: From the ground up to 2 1/2 feet, 149 larvae; from 2 1/2 feet up to 10 feet, 43 larvae; and from 10 to 15 feet, no larvae. This tree was located in a young black locust stand that had been severely injured during the past season and all indications point to severe injury this coming season."

In the November Monthly Letter it was stated that rather large shipments of birch leaves containing hibernation cells of the larvae of the leaf mining sawfly (Phyllotoma nemorata Fall.) had been received at Melrose Highlands from the Budapest, Hungary, sublaboratory. Additional material, collected in Freistadt, Austria, was received during November and was cared for by P. B. Dowden and D. L. Parker. The latter reports that in shipments received this month there were 907 normal cells of Phyllotoma, 163 cells which had been cut from the leaves, 100 cells formed between two layers of paper, and 23 braconid parasites and one chalcid in the mines of Phyllotoma. All the material received this fall has been prepared for hibernation at the laboratory in various ways. Some is held dry, some upon peat moss over sand, and some on a screening placed over peat moss and sand."

An account of the collection of these infested leaves is reported by W. F. Sellers, Budapest, Austria, who says: "Collections of infested leaves of birch (mostly Betula verrucosa) were made at Freistadt and Monichkirchen, Austria, to obtain material for shipment to America. This work was begun in September and finished in October. At Freistadt, 29,458 leaves were collected on 24 widely separated moors. * * * three men scouted an area of about 860 square kilometers to locate the infestations, which were apt to be on two or three trees. The heavy infestations were found at altitudes between 630 meters and 950 meters. One worker collected as many as 1,978 infested leaves in a day. At Monichkirchen 2,157 infested leaves were collected in a territory covering 300 square kilometers. Phyllotoma was scarce and trees bearing any considerable number of infested leaves were rare."

Commenting further on the parasitism of the pine tip moth (Rhyacionia frustrana Comst.) by Campoplex frustranae Cushman, L. G. Baumhofer, Halsey, Nebr., says: "In a plantation of western yellow pine

near the original liberation point of the introduced parasite, Campoplex frustranae, the number of terminal shoots infested by Rhyacionia frustrana bushnelli had been reduced to a minimum of 15 per cent in 1930 (14 per cent additional infested by R. neomexicana) with a parasitism, from all parasites, of 78 per cent for the first generation; in 1931 with only 11 per cent parasitism, 32 per cent of the terminals were infested (28 per cent additional by R. neomexicana)."

CEREAL AND FORAGE INSECTS

L. P. Rockwood, Forest Grove, Oreg., reporting on a recent study of the parasitism of the wheat joint worm (Harmolita tritici Fitch), believed to have been present in western Oregon for a comparatively short time says: "Dissection of the late fall collection of infested stubble from the sample farm in the Molalla district was completed during the month. * * * Using the stages of parasites and joint worms actually present in the stubble at the time of the examination as the basis of our calculations, conditions were as follows:

Parasitism by Eurytoma parva (Girault) Phillips	32.8 per cent
" " Ditropinotus aureoviridis Crawf. (present)	20.1 per cent
Issuance holes (mostly Ditropinotus)	9.1 per cent
Parasitism by eupelmids (Eupelminus saltator Lind., E. allynii, Calosota)	5.4 per cent
Undetermined parasites	-1. per cent
Total parasitism	67.5 per cent

On this basis the survival of H. tritici would have been 32.4 per cent. However, since the eupelmids, Ditropinotus, and Calosota, especially the eupelmids, frequently act as secondary or tertiary parasites, these percentages do not show the true history of the stubble. Examination indicated that Eurytoma that had entered more than one cell had destroyed 148 additional Harmolita. This added to those actually counted in the examination increased the destruction by Eurytoma from 32.8 per cent to 38 per cent, and total parasitism to 70.1 per cent. The examination also showed that 148 other Eurytoma had been destroyed by other parasites (Ditropinotus, eupelmids), so that had Eurytoma been left undisturbed, its parasitism would have been 45.8 per cent, but still considerably less than the combined parasitism of all the parasites, 70.1 per cent. Many cases of superparasitism were noted. In one such case, a Ditropinotus larva was found which had destroyed another Ditropinotus (or possible a eupelmid) which had destroyed a Eurytoma which had destroyed a joint worm."

E. V. Walter and Lee Seaton, San Antonio, Tex., have been making "observations on the occurrence of the sorghum midge (Contarinia sorghicola Coq.) in the El Paso Valley, both north and east of El Paso, and in the Big Bend country near Presidio. Eupelmus popa Gir. was the only parasite to emerge from any of these heads. It is somewhat of a mystery

as to just what has happened to the other parasites which were so abundant on the midge before the appearance of Eupelmus popa in this section. Only one other parasite, Tetrastichus sp., has been found in the five years since I came to San Antonio and that species only one season and in extremely small numbers. Eupelmus popa is an external parasite while the others are internal parasites. In case Eupelmus popa does not find enough midge to complete its development it will attack the kernel itself. Considering these habits it is possible that Eupelmus popa has destroyed the other parasites while doing very effective work against the midge, although it would hardly seem possible for it to cause such complete elimination of the other parasites."

Mr. Walter also reports observations on the harvester ant (Pogonomyrmex barbatus F. Smith). He says: "The female in my observation cage died on November 6. This made 126 days she was kept in the observation cage. During this time she did not come out of her nest to secure food nor was there any evidence that any food was carried into the nest from outside. During this time seven young were reared from a total of 62 eggs found near the beginning of the period under which she was under observation. A number of eggs were deposited at later dates but it is impossible to give the total number of eggs deposited since there was a constant turn-over in eggs deposited and eggs eaten. It was observed that both adult and young are cannibalistic and feed on the younger larvae and eggs. The queen was observed eating one of the eggs and she was observed to feed eggs to the larvae."

J. C. Frankenfeld completed the fall collection of egg masses of the range caterpillar (Hemileuca oliviae Ckll.) and returned to the Tempe, Ariz., laboratory November 24. His report includes the following statement: "In two areas, one near Miami, New Mex., about 6 miles west of Springer, and the other at Nolan, New Mex., about 5 miles southwest of Colmor, considerable parasitism of Hemileuca oliviae pupae occurred this season. It is impossible to make a count on the percentage of parasitism but a conservative estimate would approximate 30 per cent. The parasite is without a question Chalcis ovata Say, a common pupal parasite in the Southwest. Occasional parasitized pupae could be found in almost every locality in the infested area visited, but in only these two were they numerous enough to be of any importance."

Mr. Frankenfeld also states that "in areas where liberation of Anastatus semiflavidus Gahan were made last year adult parasites were observed parasitizing host eggs. As late as November 20 these parasites were found to be active, although several severe frosts had occurred prior to this date."

J. R. Parker and R. L. Shotwell, of the Bozeman, Mont., laboratory, furnish the following report on the condition of grasshopper eggs

in the heavily infested area of South Dakota, as of the first week in November: "Few egg predators were found and eggs were present in large numbers and in excellent condition. Six quarts of eggs were obtained for laboratory use."

Prof. H. C. Severin, of the South Dakota Agricultural College, has furnished the Bozeman laboratory with over one hundred named species of South Dakota grasshoppers, regarding which Doctor Parker says: "This is a most valuable addition to our grasshopper collection and will enable us to name by comparison many specimens that would otherwise be sent away for determination."

B. E. Hodgson and H. J. Cronin, of the Arlington, Mass., corn borer laboratory, report on the occurrence of partial generations of the corn borer in Massachusetts for a series of years: "As early as 1920 it was realized that the second generation was not complete; that is, that there was a portion of the first-generation borers which failed to make this summer pupation. This proportion of single-generation individuals varies from year to year, as shown by seasonal-history records. The figures indicate that in the vicinity of Arlington, Mass., it was 39 per cent in 1920, none in 1921, 14 per cent in 1922, 40 per cent in 1923, 22 per cent in 1924, 40 per cent in 1926, 37 per cent in 1927, 49 per cent in 1928, 27 per cent in 1929, 12 per cent in 1930, and 32 per cent in 1931. It was noted several years ago that there was a tendency for these single-generation individuals to be more numerous on the second early plantings of corn than on the very earliest plantings, suggesting that, of the moths emerging from overwintering material, the earliest appearing ones might give rise to two generations and the later appearing ones to one generation. Experiments were started in 1928 and continued in 1930 and 1931 in an attempt to determine this point." The summarized results of these experiments indicate "that there is a decided tendency for early emerging moths to give rise to two generations and late emerging moths to one generation. Although this knowledge is definitely of value in seasonal-history studies, it may serve a practical purpose in helping to solve other problems in studies of abundance, parasites, and other control methods."

C. H. Batchelder, of the Arlington, Mass., corn borer laboratory, has completed his experiments in the sterilization of sweet corn by means of low temperatures to a point where he is able to furnish the following report: "Experiments reported here in November indicated that, due to the resistance to cold, characteristic of the European corn borer, and because it inhabits a host providing very effective insulation, green sweet corn must be processed by means of zero or subzero temperatures (Fahrenheit). The several methods of refrigeration meeting these requirements and available for the practice of cold sterilization are usually referred to as 'slow freeze,' 'sharp process,' and 'quick-freeze' processing. Infested sweet corn ears were refrigerated by these methods during September, 1931. It was found that when green "Whipples Yellow," one of the largest of the sweet corn varieties, is exposed between the shelving of a —22° F.

plate-froster the infesting larvae are killed within four hours. Sweet corn so processed is stored at --20° F. until shipped and this treatment precludes the possibility of transportation of living material to uninfested territory. This 'quick freeze' method was found to be the most rapid refrigeration process and further usefulness is indicated if, for the same purpose, it is applied to infested products other than corn, such as lima beans. The 'sharp process' employed at --20° F., cold room, was found to be effective during an 18-hour exposure in killing all infesting larvae. The 'slow freeze' method of refrigeration employing cold-room temperatures of zero and 30° F. was found to require an extended period of exposure in order to be effective. The minimum safe exposure when the top of the standard bushel pack is ventilated was found to be 8 days following the time at which the center of the pack reaches zero. A total exposure of 14 days to 30° F. killed only 33.3 per cent of the infesting population."

INSECTS AFFECTING MAN AND ANIMALS

In the September Monthly Letter a report by O. G. Babcock, Sonora, Tex., on the control of goat lice was given. Mr. Babcock now says: "The goats that were dipped at Menard, Tex., on June 16 and 27 are still apparently free of lice. This comprises an approximate total of over 2,000 goats on five ranches."

Mr. Babcock reports results of experiments in trapping blowflies with various baits. He says: "The two most interesting baits in the blowfly bait tests were the dipyridyl oil and the nicotine. The dipyridyl oil added to the liver started out with a high acidity, and did not catch very well at first, but after the 14th day it began to catch quite well. The same was true for the nicotine-liver bait. The pH value for the nicotine-liver bait runs just a little higher than for the dipyridyl oil-liver bait. These pH tests indicate rather strongly that the pH values are of little value in fly-bait work, but that other factors are of greater importance. Other tests need to be run with varying amounts of nicotine and dipyridyl oil added to the bait to determine relative efficiency. All things considered, the dipyridyl oil has the most promise of anything yet used in aiding the ranchmen by developing a bait that will continue to catch over a long period of time with the least expense and at the same time be the least objecticnable bait to handle and care for, the least repulsive."

D. C. Parman, Coachella, Calif., submits a table which gives the parasitism of blowflies by Brachymeria fonscolombei Duf. and Mormoniella vitripennis Walk. at Uvalde, Tex., for the past three years. He says: "It is noticeable that the average infestation of B. fonscolombei for 1929 was 39.55 per cent; it fell to 28.42 per cent in 1930, and rose to 36.08 per cent this year; as yet not explained.

Area	Year	B. fonscolombei Number	B. fonscolombei Per cent	M. vitripennis Number	M. vitripennis Per cent	Flies Number	Flies Per cent
Total all areas	1929	12,728	39.55	5,246	0.42	19,317	60.03
	1930	6,840	28.42	9,203	1.03	16,982	70.55
	1931	3,071	36.08	1,085	0.37	5,409	63.55

Mr. Parman states that host tests made for Alysia ridibunda Say "indicate that A. ridibunda has a preference for sarcophagid larvae, as a large emergence was obtained from each successful sarcophagid test while only one parasite emerged in each of the Synthesiomyia and Lucilia tests."

R. W. Burgess, who is engaged in investigations of eye gnats (Hippelates spp.) at the Coachella, Calif., laboratory, submits data compiled by Glen O. Robertson, Agent, on status traps, showing that "the monthly status for November has been very low as compared with last year." In reviewing this report, D. C. Parman says, "it is indicated that trapping has had a very decided control on gnats. * * * These traps were started the first of March this year and others not until May. The status for July was about the same this year as last year; the August abundance was about five times as great as last year, indicating an earlier and larger fall crop to be expected. Apparently the traps took a good percentage of this generation and prevented breeding, as the 1931 status catch for September was only 7.1 per cent of the 1930; the October catch was 19.5 per cent of last year's; the November catch is 13.7 per cent of last year's. This appears to be rather more than can be expected for the number of traps in Coachella Valley, but an analysis of the status catches bears this out, as the decreases have been greatest in the areas near the traps. Idaho, for example, indicates 99 per cent control for November, and Coachella and Thermal are indicated to be almost as good."

H. H. Stage, of the mosquito investigations project, Portland, Oreg., reports that "much field work has been continued this month (November) in cooperation with the civic control agencies at Portland. The Civic Emergency Committee assigned 300 men to the Mosquito Control and Elimination Committee for the purpose of cutting and burning willow brush in the flood water district of Multnomah County, where mosquito control is practiced. This office has maintained close contact with this program because of its importance in future control. A great quantity of land is still to be cut over and the Civic Emergency Committee has accordingly approved an assignment of 250 men for this purpose for the month of December. At the end of November, approximately $30,000 has been expended on this work. The Mosquito Control Commission, in addition, has expended a total of about $450 for tools, supervision, and transportation to date."

Mr. Stage made "a survey by boat * * * down the Columbia Slough with Worth Caldwell, Director of the Civic Emergency Committee, for

the purpose of presenting to him the relation between this slough and several inlets to large lakes on St. John's Peninsula which cause a great deal of mosquito breeding when flooded. It was our idea that these inlets could be filled by hand labor furnished by the Civic Emergency Commission, and flood gates installed to prevent the flooding of several acres of land which produce mosquitoes in season in countless numbers. This boat trip was supplemented by a short airplane survey to give a quick and more apprehensive idea of the immense amount of ground involved and its relation to the slough. No definite promise has been made that these inlets will be filled, but it is believed that $15,000 will be appropriated for this purpose after the brush cutting has been completed."

COTTON INSECTS

T. C. Barber, Calexico, Calif., reporting on the life history of the cotton leaf perforator (Bucculatrix thurberiella Busck) says: "From the results of the observations made last winter, combined with the results obtained to date for the present fall, it is evident that under lower Rio Grande Valley conditions life-history development of the cotton perforator is very slow, but practically continuous through the winter, being checked only during unusually cold periods. These conditions are materially different from those obtaining in southern California, where the life-history development is practically stopped by the first killing frost, usually during the latter half of November, and is not resumed until the temperatures again moderate in the spring."

S. L. Calhoun and L. C. Fife have continued their life-history studies of the pink boll worm (Pectinophora gossypiella Saund.) at El Paso, Tex., and state: "During November it was found that the average number of eggs laid by fertile female moths of the fifth generation was 50.7 and the maximum 160. The average longevity for males and females was 11.7 and 11.4 days, respectively. The maximum longevity recorded for both males and females was 19 days. The average duration of the oviposition period was 5.7 days and the maximum was 14 days. The average duration of the preoviposition period was 2.5 days and the maximum was 8 days. The last date of oviposition recorded was November 19, a killing frost having occurred on the 15th. * * * During this period (November), the average duration of the pupal stage was 21 days. An occasional pupation and moth emergence was recorded for the fourth generation in bolls, as most of the larvae went into the long-cycle phase. In one case the duration of the pupal stage was approximately 40 days. The fifth generation in squares was completed early in the month, no larvae entering the long-cycle stage. On the other hand, all larvae of the fifth generation in bolls were of the long-cycle type. This phenomenon has been noted with other late broods and it appears that there is something present in the immature seeds in the bolls that causes the larvae to enter the long-cycle stage rather than to pupate. Many larvae of the

sixth generation in squares pupated and moths emerged, although the duration of the different stages was increased because of lower temperatures. The first moths of this generation emerged November 23. Some larvae appeared to have spun long-cycle cocoons late in the month." Mr. Fife found that "long-cycle larvae were present in the fields at least as early as September 16 and probably much earlier."

An experiment was conducted by Mr. Noble "to determine the possibility of pink bollworm moths laying fertile eggs after long flight. The treatments simulated some of the conditions to which moths would be exposed in making flight, or being carried by air currents, in the upper air at elevations of from 3,000 to 4,000 feet for periods of 1 to 7 days. The temperature at which the moths were held while isolated from cotton plants averaged approximately 60° F. This was very close to the mean temperature to which the moths would be exposed at elevations of from 3,000 to 4,000 feet above ground level." From the results of this experiment Mr. Noble concludes "that it is biologically possible for a female moth to start or to continue oviposition upon finding cotton again after being isolated from this plant for periods of 1 to 7 days. In other words, one female moth can start an infestation in cotton after a several days' migratory flight from the field where it originated."

C. S. Rude, stationed at the Tlahualilo, Dgo., Mex., sublaboratory, reports: "No (pink bollworm) moths were taken from the migration screens during the month. This is a very unusual record for Tlahualilo. It is possible that the unusually dry fall has had something to do with the extremely light catch this year." However, 22 moths were taken in the trap in 47 nights when it was operated three nights each week from August 1 to November 18." Mr. Rude says: "It is of interest to note that during August the number of males and females was almost equal but that later there were about four females to each male attracted to the light."

Mr. Rude also reports: "Three species of wild malvaceous plants have been studied to determine their rôle in the continuation of pink bollworm infestation in the absence of cotton. Hibiscus cardiophyllus Gray proved to be a true host plant. The pink bollworm overwintered successfully in seed capsules of this plant, moths emerged the following spring, reinfested this plant, and development continued throughout the growing season. Furthermore, this plant is quite commonly found infested in its native habitat in the Campaña Mountains near Tlahualilo." Infestation of seed pods of Hibiscus spp. in the laboratory gave the following percentage of 'take': "H. coulteri Gray, 63.7; H. cardiophyllus, 36.06; H. denudatus Gray, 15.6. * * * Of the cultivated plants studied, okra is quite heavily infested. The pink bollworm can overwinter successfully in the pods, and moths emerge the following year."

C. L. Smith and C. S. Rude have been making a comparative study of the pink bollworm and the boll weevil in a combined infestation. They report: "These studies show that the presence of the boll weevil in cotton fields in fairly large numbers does not affect the development of the pink bollworm. Larvae of both species developed together in both squares and bolls. It can thus be stated that should the pink bollworm ever invade the eastern cotton belt, the boll weevil would not check its development--nor would the pink bollworm check weevil development."

STORED PRODUCT INSECTS

Wallace Colman, Silver Spring, Md., reports the following results on the use of paradichlorobenzene against clothes moths in closets: "Fumigation tests in clothes closets have shown that in a reasonably tight 100 cubic foot closet whose walls are made of porous material such as wall-board, the evaporation of 325 grams (about 11 ounces) of paradichlorobenzene over a period of 48 hours will produce 100 per cent mortality of clothes moth larvae. The fumigation efficiency of such a closet is greatly increased by coating the interior with shellac. A shellaced closet requires only 50 grams to produce the same effect."

Newell E. Good, reporting "further experiments on the penetration of flour bags by (the confused flour beetle) Tribolium confusum Jacq. Duv., (the saw-toothed grain beetle) Silvanus surinamensis (L.), and (the Indian-meal moth) Plodia interpunctella Hbn., substantiate a previous report that these insects are unable to penetrate fine woven cambric bags except occasionally along seams. However they will readily penetrate the Osnaberg and jute bags."

George B. Wagner, Kansas City, Mo., states that on November 21 to 23 the personnel of his laboratory assisted a milling company in Kansas in the fumigation of their warehouse which is typical of the mill warehouses in the Southwest. Mr. Wagner says: "The warehouse contained a total of 131,250 feet and 159,528 pounds of flour and mill products were stored in this building. * * * Thirty pounds of liquid hydrocyanic acid in the form of cardboard discs was distributed uniformly about the warehouse, after which the exit door was sealed. Thirty pounds of liquid hydrocyanic acid was pumped into the warehouse * * * Exposure, 37 hours; dosage per 1,000 cubic feet, 7.31 ounces; wind velocity, 15 miles per hour from the southwest until Monday, November 21, when the wind increased to a 40-mile gale; rainfall, 1.25 inches; temperature 70° and dropped as low as 55° during the experiment. The per cent kill was 90.5. * * * checks placed in interstices of shorts gave 100 per cent kill; checks placed in bran--100 per cent kill; checks placed in flour--68.75 per cent kill; checks placed in stacks of 24 pounds of cornmeal--

100 per cent kill; checks placed in stacks of 10 pound cornmeal--100 per cent kill. * * * Flour seems to have a greater affinity for gas than any other mill product. When the stacks of bags were taken down to recover the check boxes, live insects were noted crawling between the bags, indicating that it was impossible to kill insects located between the bags where bags were lying directly on others. The experiment, however, indicates the advisability of continuing similar warehouse experiments. It further indicates the importance of knowing the adsorption capacity of flour and mill products, not only for warehouse fumigation but vault fumigation also."

Perez Simmons, Fresno, Calif., reports that six experimental fumigations of dried figs were made by Dwight F. Barnes and Heber C. Donohoe, of the Fresno laboratory, in cooperation with a dried-fruit association of California. The figs were stored in tight chambers. "Dosage rates of 4.36, 5.6, 7.85, and 8.75 pounds of liquid sulphur dioxide per 1,000 cubic feet gave unsatisfactory results, while rates of 10.8 and 13.96 pounds gave complete mortality. During the last fumigation, in which a dosage rate of 13.96 pounds was used, the temperatures ranged from 55° F. at the start to 48° F. at the end. A hot water bath, heated by a gasoline torch, was used to warm the sulphur dioxide cylinder, in which a pressure of about 80 pounds per square inch was maintained. Inside the chamber the outlet tube was branched and attached to four so-called Venturi tubes for mixing the gas with air."

Mr. Simmons also states that a company dealing in dried fruits in California engaged a professional fumigator to fumigate their warehouse containing about 290,000 cubic feet capacity and said to contain between 450 and 500 tons of figs with hydrocyanic acid gas, "the gas being forced into the building through a hose, under its own pressure." The rate was said to have been "about 600 pounds (33.1 ounces per cubic foot)." At the request of the owners of the figs Mr. Simmons had test boxes of fig-infesting insects planted "at 1-foot intervals from the surface to a depth of 5 feet, in each of 2 piles. After 8-1/2 days, when the house was opened, all insects within 1 foot of the surface were dead. Below 1 foot the kills were irregular, ranging from 55 per cent to 100 per cent. All control insects were alive at the end of 8-1/2 days."

"Slide mounts of the genitalia of several species of Ephestia, prepared by John R. Arnold, were received back on October 30 from Mr. Heinrich of the taxonomic unit, who confirmed the identifications, all of which were correct," states Mr. Simmons. "By far the most numerous species at present is Ephestia figuliella Gregson. In our report to the Fig Institute on November 6 we proposed 'raisin moth' as a common name for this species for the reason that it is most abundant in raisins and that the larvae have become quite generally known as 'raisin worms.'"

W. D. Reed, in charge of the Tobacco Insect Laboratory at Richmond, Va., apparently is not ambitious to have the important new pest of

tobacco, Ephestia elutella, called the tobacco moth. He states that in a review of the literature of this insect he finds that it "has been recorded by the following common names: chocolate moth, walnut moth, currant moth, and cacao moth. Since Chittenden in 1897 recorded the insect as the 'chocolate moth' and since perhaps it inflicts greater damage to chocolate and cacao than to any other commodity, we should like to propose that the American Association of Economic Entomologists approve chocolate moth as the common name of this insect."